Aging and Forgetting: Forgotten Information Is Perceived as Less Important Than Is Remembered Information

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Recently, researchers have evaluated the mechanisms that contribute to younger adults' metacognitive monitoring. According to analytic-processing theory, people's beliefs about their memory are central to their monitoring judgments. Although this theory has received ample support with younger adults, it has yet to be evaluated with older adults. We aimed to address this gap in the literature. Specifically, we evaluated younger and older adults' beliefs about forgetting, and the role of these beliefs in their judgments about forgotten information. Younger adults tend to recall forgotten information as being less important than remembered information (dubbed the *forgetting bias*). Moreover, this bias is largely driven by their beliefs about forgotten information. In the present research, we evaluated (a) whether older adults also show a forgetting bias and (b) the contribution of their beliefs to this bias. In Studies 1 and 2, participants completed a value-directed remembering task. Next, participants took a surprise cued-recall test for the values. In Study 2, we evaluated participants' beliefs by having them make a memory-for-past-test judgment prior to recalling the values. In Study 3, we directly probed participants' beliefs about the value of forgotten information with a survey. Older and younger adults demonstrated a forgetting bias. Moreover, and consistent with analytic-processing theory, people's beliefs about forgotten information contributed to this bias. Thus, beliefs are an important mechanism that contribute to both older and younger adults' metacognitive monitoring.

Keywords: aging, beliefs, metamemory, forgetting, value-directed remembering

A current emphasis in metamemory research is to evaluate the mechanisms that contribute to ongoing evaluations and assessments of memory–metacognitive monitoring. Specifically, metacognitive monitoring can be driven by two nonmutually exclusive mechanisms: people's beliefs about memory and their experiences during learning (e.g., Dunlosky, Mueller, & Tauber, 2015; Koriat, 1997). In the present research, we focused on the contribution of

beliefs to older adults' monitoring because recent research has demonstrated that beliefs have a substantial impact on younger adults' monitoring (e.g., Hu et al., 2015; Mueller, Dunlosky, Tauber, & Rhodes, 2014; Mueller, Tauber, & Dunlosky, 2013; Susser, Jin, & Mulligan, 2016). A belief refers to any idea that people have about the impact of a cue on task performance. For instance, older adults have low self-efficacy in their memory (e.g., Rebok & Balcerak, 1989; West, Bagwell, & Dark-Freudeman, 2008). That is, older adults often believe that they will perform poorly on a memory task. This belief may lead older adults to make lower predictions relative to younger adults when monitoring their performance on a task (e.g., Hertzog, Dixon, & Hultsch, 1990; Serra, Dunlosky, & Hertzog, 2008).

According to analytic-processing theory (Dunlosky et al., 2015; Mueller & Dunlosky, 2017), when monitoring performance, people search for cues that can help them to reduce their uncertainty about how they will perform on a task. Further, people can rely on their preexisting beliefs about that cue, or they can develop new beliefs about that cue based on information they gain during the task, to predict their performance. Thus, from this perspective, people's beliefs are central to their monitoring judgments. Ample research with younger adults is consistent with this theory (for reviews, see Dunlosky et al., 2015; Su et al., 2018). Although there has been a surge of research evaluating this theory with younger adults, the role of beliefs in older adults' monitoring judgments has

been largely unexplored. Accordingly, in the present research, we sought to contribute to metacognitive theory by evaluating older and younger adults' beliefs about forgetting, focusing on how their beliefs contribute to their judgments about forgotten information.

Younger adults tend to devalue information that has been forgotten (termed the *forgetting bias*; Castel, Rhodes, McCabe, Soderstrom, & Loaiza, 2012). Moreover, the forgetting bias is largely driven by younger adults' belief that forgotten information is less important than remembered information (Rhodes, Witherby, Castel, & Murayama, 2017). Currently, it is unclear whether older adults will also show a forgetting bias. Given abundant evidence that has demonstrated that younger adults use their beliefs to make monitoring judgments, we anticipated that beliefs would also be central to older adults' judgments. Moreover, a compensatory framework for aging would predict that older and younger adults may approach the task of monitoring their memory performance differently, because they differ in the cognitive resources available for completing the task (cf. Baltes, 1997; Baltes & Baltes, 1990). Specifically, to compensate for the fact that older adults have fewer cognitive resources available relative to younger adults, they may be especially likely to rely on their prior knowledge (cf. Brashier, Umanath, Cabeza, & Marsh, 2017; Umanath & Marsh, 2014). Thus, older adults' beliefs should have a larger impact on their monitoring judgments relative to the impact of younger adults' beliefs on their monitoring judgments, which may result in age-related differences in the forgetting bias.

In the present research, we evaluated older and younger adults' beliefs about the value of forgotten information. A compensatory account of aging would predict that older adults would be especially likely to use their beliefs when monitoring their performance. Moreover, older adults may hold different beliefs relative to younger adults, which may impact the forgetting bias. Specifically, given their lifetime of experience with forgetting, older adults may have more accurate beliefs about forgetting relative to those of younger adults. If so, older adults may not demonstrate a forgetting bias. Alternatively, older adults can selectively remember valuable information (e.g., e.g., Castel, Benjamin, Craik, & Watkins, 2002; Castel et al., 2011), and as such, may believe that they are most likely to remember important information and forget less important information. If so, older adults may demonstrate a larger forgetting bias relative to younger adults.

Theoretical Approaches to Metacognitive Monitoring

The forgetting bias is an example of a metacognitive monitoring bias. Metacognitive monitoring, which refers to the ongoing assessment of one's cognitive processes, is often investigated by having people make judgments about their cognitive processes (for reviews, see Dunlosky & Metcalfe, 2009; Tauber & Dunlosky, 2016). In contrast with well-established deficits in episodic memory that occur with age (for a review, see Zacks, Hasher, & Li, 2000), metacognitive monitoring is generally spared with age (for recent reviews, see Castel, Middlebrooks, & McGillivray, 2016; Tauber & Witherby, 2016). Although many researchers have explored the accuracy of older adults' monitoring, few have investigated the mechanisms that contribute to older adults' monitoring judgments. Evaluating the mechanisms underlying monitoring judgments is important because people use their judgments to regulate their behavior, which can influence other cognitive pro-

cesses such as learning and memory (e.g., Dunlosky & Hertzog, 1997; Thiede, 1999).

According to contemporary theoretical perspectives, metacognitive monitoring reflects inferences learners make based on beliefs about how available cues will influence their performance when monitoring memory (cue-utilization theory, Koriat, 1997; analytic-processing theory, Dunlosky et al., 2015) Recent evidence is consistent with these perspectives (e.g., Blake & Castel, 2018; Hu et al., 2015; Jia et al., 2016; Mueller & Dunlosky, 2017; Mueller et al., 2013, 2014; Susser et al., 2016). To illustrate, Witherby and Tauber (2017) used two measures to evaluate the contribution of younger adults' beliefs about concreteness to their predictions of future memory performance (i.e., judgments of learning [JOLs]). Beliefs were solicited via a survey and, by having participants make JOLs for concrete and abstract words prior to studying the actual words (i.e., prestudy JOL design; Castel, 2008a) and after studying the actual words (i.e., immediate JOL design). The outcomes of these experiments showed that younger adults believed that concrete words were more memorable than abstract words, and that they used this belief when making JOLs for concrete and abstract words.

Value-Directed Remembering Paradigm and the Forgetting Bias

A common way to investigate people's memory for important relative to less important information is via a value-directed remembering paradigm (e.g., Castel, 2008b; Hayes, Kelly, & Smith, 2013; McGillivray & Castel, 2017; Robison & Unsworth, 2017). To illustrate, Castel, Benjamin, Craik, and Watkins (2002) had older and younger adults study a list of 12 words. Each word within a list was paired with a point value from 1 to 12. Participants were instructed to earn as many points as possible. Thus, they could increase their total score by remembering several words and by selectively learning the most valuable ones. After studying the list of words, participants took an immediate free-recall test with the procedure repeated for 48 lists. Of most interest, both age groups demonstrated superior recall for words that were paired with higher point values relative to words that were paired with lower point values, a finding which has been replicated in a number of experiments with various stimuli and populations (e.g., Castel, Balota, & McCabe, 2009; Castel et al., 2011; DeLozier & Rhodes, 2015; McGillivray & Castel, 2011; Middlebrooks, McGillivray, Murayama, & Castel, 2016; Wong et al., 2018).

Researchers have used a value-directed remembering paradigm to evaluate how people regard information that has been forgotten (Castel et al., 2012; Rhodes et al., 2017). Evaluations of forgetting have a number of practical and theoretical implications. For example, consider the experience of forgetting to e-mail a colleague. One might explain this experience by assuming that the e-mail was not important, suggesting that information might be downgraded in importance when it is forgotten (cf. Ray, Gomillion, Pintea, & Hamlin, 2018). Castel, Rhodes, McCabe, Soderstrom, and Loaiza (2012) tested this idea with a group of younger adults. Specifically, participants completed a value-directed remembering task. After completing the final free-recall test for the words, participants received an unexpected cued-recall test on which they were presented with each word and tasked with recalling the point value that was paired with it during study. Participants recalled lower

point values for words that they had forgotten relative to words that they had remembered on the free-recall test. Moreover, follow-up analyses showed that this forgetting bias held even when controlling for the actual value of the studied words (see also Rhodes et al., 2017).

Mechanisms Producing Monitoring Effects About Forgetting

Although few researchers have investigated the mechanisms that contribute to people's monitoring judgments made about *forgotten information*, some evidence suggests that beliefs may play a key role (e.g., Koriat, Bjork, Sheffer, & Bar, 2004; Rhodes et al., 2017). For instance, Rhodes, Witherby, Castel, and Murayama (2017) evaluated the contribution of younger adults' beliefs about memory to the forgetting bias. Younger adults completed a value-directed remembering task. Next, they were presented with each word that they had studied and made a memory for past test (MPT) judgment (cf., Finn & Metcalfe, 2007, 2008), indicating whether they recalled that word on the earlier free-recall test. The participants then recalled the value that was associated with that word during study. If participants believed that their past test performance provides information about the importance of previously studied information, then the values that they recalled should be influenced by their MPT judgments.

Rhodes et al. (2017) investigated recalled value for words that received a correct MPT judgment (e.g., remembered words that were correctly judged as remembered) and for words that received an incorrect MPT judgment (e.g., remembered words that were mistakenly judged as forgotten). If participants' beliefs about their memory contribute to the forgetting bias, then when they make a correct MPT judgment, they should recall higher values for remembered words and lower values for forgotten words. In contrast, when they make an incorrect MPT judgment, they should recall higher values for forgotten words (that were mistakenly judged as remembered) and lower values for remembered words (that were mistakenly judged as forgotten). Rhodes et al.'s (2017) findings were consistent with this hypothesis. Specifically, younger adults recalled higher values for words that were judged as remembered and lower values for words that were judged as forgotten. Critically, this was true in instances when participants made incorrect MPT judgments. For example, recalled value for forgotten words that were incorrectly judged as "remembered" did not differ from recalled value for remembered words correctly judged as "remembered." Thus, consistent with analytic-processing theory, current evidence suggests a strong role of beliefs in the forgetting bias demonstrated by younger adults.

Present Research

In sum, theoretical accounts of metacognitive monitoring predict that people's beliefs will contribute to their monitoring of forgotten information. Moreover, a compensatory framework of aging would predict that older adults will rely on their beliefs to a greater extent than younger adults. Even so, older adults may hold different beliefs about forgetting, which may lead them to perform differently than younger adults when monitoring the importance of forgotten information. Given that aging is associated with declines in many forms of episodic memory (e.g., Hultsch, Hertzog, Small, McDonald-Miszczak, & Dixon, 1992; Zacks et al., 2000), older adults frequently experience forgetting and complain that their memory is declining (e.g., Cargin, Collie, Masters, & Maruff, 2008; Schweich et al., 1992). Thus, relative to younger adults, older adults have had plenty of experiences forgetting important information (e.g., a person's name, directions, to take medications) and have had to deal with the consequences of them (e.g., being embarrassed, getting lost, experiencing negative health outcomes). As such, older adults may have more accurate beliefs about forgetting relative to younger adults and may not believe that forgotten information is less important than remembered information. Thus, older adults' may not show a forgetting bias (or may show an attenuated bias). Alternatively, ample research has demonstrated that older adults can selectively remember the most important information (e.g., Castel et al., 2002, 2011). Thus, older adults may believe that they remember the most important information at the expense of less important information. As such, they may demonstrate a larger forgetting bias relative to that of younger adults. Finally, it is possible that older and younger adults hold similar beliefs about forgetting, and as such, age-related differences in the forgetting bias may not be observed.

In the present research, we investigated the contribution of older and younger adults' beliefs to their judgments made about forgotten information. Critically, there are many ways to operationalize beliefs and multiple beliefs can drive people's perceptions of performance. Thus, in the present research, we evaluated two kinds of beliefs that people may hold about the value of forgotten information. First, we evaluated older and younger adults' belief about the value of remembered and forgotten information in two ways: with a paradigm established in previous research (Studies 1 and 2; cf. Castel et al., 2012) and with a survey that explicitly probed their beliefs (Study 3; cf. Koriat et al., 2004). Second, we evaluated people's beliefs about whether prior recall performance is indicative of the value of information using a memory for past test paradigm (Study 2; cf. Rhodes et al., 2017). Thus, the studies reported can provide converging evidence about the role of beliefs and in older and younger adults' memory monitoring that is not tied to any single measure.

Study 1

Younger and older adults studied four lists of words in which each word was paired with a point value from 1 to 12. Immediately after studying each list, participants took a free-recall test. Next, participants took a surprise cued-recall test for the value that was associated with each word during study. As in previous research, we expected younger adults to demonstrate a forgetting bias. Moreover, if older adults believe that forgotten information is less important than remembered information, we would also expect them to show a forgetting bias (i.e., recall lower values for forgotten words relative to remembered words).

Method

Participants. In all studies, target sample sizes were determined based on previous research (Castel et al., 2012; Rhodes et al., 2017). Participants included 44 younger adults (M_{age} = 19.70, SE = 0.65) and 40 older adults (M_{age} = 72.08, SE = 0.96). Younger adults were recruited from Texas Christian University's

psychology research pool and received partial course credit for participating. Older adults were recruited from the Fort Worth community and were compensated with a $10 gift card. The gender distribution significantly differed between the younger adults (41 women, three men) and the older adults (20 women, 20 men), $\chi^2(1, N = 84) = 19.65$, $p < .001$. Older adults reported completing significantly more years of education ($M = 16.20$, $SE = 0.46$) relative to younger adults ($M = 13.11$, $SE = 0.19$), $t(82) = 6.41$, $p < .001$, $d = 1.15$. All participants were treated in accordance with ethical guidelines and the research was approved by an institutional review board.

As is common in aging research, participants completed measures of cognitive functioning (pattern comparison task, letter comparison task, Salthouse, 1993; and a vocabulary task, Ekstrom, Frinch, Harmon, & Dermen, 1976). For the pattern comparison task, participants were given two pages each with 30 pairs of line patterns. Participants were given 30 s per page to decide whether each pair was the same or different. Similarly, for the letter comparison task, participants were given two pages each with 21 pairs of strings of letters (e.g., YCX ___ YMX). Participants were given 30 s per page to decide whether each pair was the same or different. Finally, the vocabulary test consisted of 36 items, in which participants were given a word and were tasked with identifying a synonym for that term among five alternatives. Participants were given 4 min to complete as many as possible. The dependent measure for all tasks was the mean proportion correctly answered (see Table 1 for descriptive and inferential statistics). Younger adults outperformed older adults on the pattern comparison task and the letter comparison task. Older adults outperformed younger adults on the vocabulary task.

Materials and procedure.   Materials consisted of 60 concrete nouns. Words were randomly divided into five lists of 12 words. Four served as the experimental lists and one served as a practice list. Words in each list were equated for length and word frequency, $Fs < 1$.

Participants were presented with one list at a time. Each word within a list was randomly assigned a value from 1 to 12. Participants were told to regard the value as points in a game, in which their goal was to acquire points by (a) remembering as many words as possible and (b) placing emphasis on remembering the words

Table 1

Scores on the Tasks Included in the Cognitive Battery in Studies 1 and 2

Task	Older adults	Younger adults	Inferential statistics
Study 1			
Pattern comparison	.46 (.01)	.68 (.02)	$t(82) = 9.91$, $d = -1.47^*$
Letter comparison	.44 (.02)	.62 (.02)	$t(82) = 7.46$, $d = -1.27^*$
Vocabulary test	.56 (.03)	.41 (.01)	$t(82) = 5.15$, $d = .98^*$
Study 2			
Pattern comparison	.50 (.02)	.67 (.02)	$t(78) = 5.55$, $d = -1.06^*$
Letter comparison	.47 (.01)	.64 (.02)	$t(78) = 7.61$, $d = -1.30^*$
Vocabulary test	.65 (.03)	.40 (.01)	$t(78) = 8.43$, $d = 1.37^*$

Note.   The values under the older and younger adult headers represent the mean proportion of items correctly identified, with the corresponding standard errors of the mean in parentheses.
* $p < .001$.

paired with the highest values. Each word was presented for 2 s, with the point value directly beneath it. Presentation order was randomized anew for each participant. Once all 12 words and their corresponding values were presented, participants were given 1 min to recall as many words from that list as they could remember. Participants typed their responses and could recall the words in any order. Participants completed this procedure first for a practice list. After completing the practice list, participants were shown the words from the list with their corresponding values. A research assistant explained how their total point value would be calculated by totaling the sum of the point values associated with each word that they recalled. Participants were then given the opportunity to ask any questions. Next, participants repeated this study-test procedure for the four experimental lists. List order was counterbalanced such that each list occurred equally often in each position (1–4) of presentation order.

Following the final free-recall test (i.e., recall test for List 4), participants received a surprise cued-recall test for the study values. On the cued-recall test, participants were presented with all the words that had previously appeared in the experimental lists (i.e., 48 words) and were asked to recall the value that was associated with each word during study. Presentation order was blocked such that the lists on the cued-recall test occurred in the same order as during study, but words within each list were randomized anew per participant. The cued-recall test was self-paced and participants were instructed to provide their best guess if they could not remember the original value.

Results

Data were analyzed via hierarchical linear models (HLM) with random participant effects for Studies 1 and 2 (cf. Middlebrooks & Castel, 2018; Middlebrooks, Murayama, & Castel, 2016; Murayama, Sakaki, Yan, & Smith, 2014). HLM analyses are powerful and were conducted for two primary reasons. First, trials were nested within-participants and mixed-effects models account for within-participant variance and nonindependence of data. Second, mixed-effects models treat study value as a continuous variable (rather than a variable with 12 categories) and can account for missing data.[1] Given the nature of these experiments, most participants were missing some data. For example, if a participant did not recall any words that were assigned a value of "6," the participant would have missing data for that cell and would be list-wise deleted with an analysis of variance (ANOVA).

For all analyses in Studies 1 and 2, STATA statistical software was used (StataCorp, 2009) and study value was treated as a continuous variable centered at the group mean. Even so, all figures are presented with study value collapsed into quartiles to facilitate ease of interpretation.

Free-recall for words.   A logistic hierarchical linear model (HLM) predicting word recall (0 = forgotten, 1 = recalled) was conducted. The model included the intercept and two predictors: study value and age group. Study value was specified as a random effect. Age group was dichotomous (0 = older adult, 1 = younger

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[1] Researchers have suggested that categorical data with five or more categories can be treated as continuous (Rhemtulla, Brosseau-Liard, & Savalei, 2012). We thus treated study value, consisting of 12 categories, as continuous in the present analyses.

adult). The interaction between study value and age group was also included.[2] Outcomes from the analysis are presented in Table 2.

Free-recall performance was superior for younger relative to older adults (see Figure 1). Specifically, there was a significant main effect of age group indicating that younger adults were 2.41 times more likely to recall a word than were older adults. Additionally, there was a significant main effect of study value. For older adults, each 1-point increase in study value resulted in them being 1.23 times more likely to recall the word. The interaction between age group and study value was significant. To probe this interaction, we conducted a new model with the coding for age group reversed (i.e., 0 = younger adults, 1 = older adult). Reversing the coding for the age group variable allows for an evaluation of the exact beta values for the reference group (i.e., the group coded as zero), so that conclusions can be made about how each predictor affects that age group in particular. That is, in the original analysis, the beta value for study value indicates the influence of study value on recall for older adults (i.e., older adults coded as zero). With the second analysis, the beta value for study value indicates the influence of study value on younger adults' recall (i.e., younger adults coded as zero). This analysis revealed that the interaction was a result of the main effect of study value being weaker for younger adults, $b = .15$ ($SE = .02$), $t = 8.37$, $p < .001$, 95% CI [.11, .19], relative to older adults (i.e., $b = .21$).

Value recall. The analyses of value recall are the primary analyses of interest concerning the forgetting bias. Specifically, a forgetting bias is evident if a significant main effect of recall is observed. Participants' recalled value as a function of study value and memory status (remembered vs. forgotten) is presented in Figure 2. An HLM analysis predicting participants' value recall was conducted. The model included the intercept and three predictors: study value, age group, and word recall. Age group was dichotomous (0 = older adult, 1 = younger adult) as was word recall (0 = forgotten, 1 = remembered). Study value and word recall were specified as random effects. The interactions between these variables (i.e., three two-way interactions and one three-way interaction) were also included. Outcomes from the analysis are presented in Table 3.

Of most interest, there was a significant main effect of word recall on value recall, indicating a forgetting bias. Specifically, both younger and older adults recalled higher values for words that were remembered relative to words that were forgotten. There was also a significant main effect of age, indicating that younger adults' recalled value was .51 points lower than older adults' recalled value. These main effects were qualified by a significant interaction between age and word recall. To elucidate this interaction, we conducted a new model with the coding for age group reversed (i.e., 0 = younger adults, 1 = older adult). The interaction indicated that the effect of recall (i.e., the forgetting bias) was stronger for younger adults than for older adults. Specifically, older adults' recalled value was .90 points higher for remembered words relative to forgotten words. Younger adults' recalled value was 1.37 points higher for remembered words relative to forgotten words, $b = 1.37$ ($SE = .16$), $t = 8.68$, $p < .001$, 95% CI [1.06, 1.68].

Finally, there was a significant main effect of study value, indicating that each 1-point increase in study value was associated with a .12 point increase in recalled value while controlling for everything else in the model. No other effects were significant.

Study 2

Younger adults in Study 1 demonstrated a forgetting bias. More important, older adults also demonstrated the forgetting bias, although it was somewhat weaker than the bias exhibited by younger adults. Based on analytic-processing theory, participants' value judgments were driven by their beliefs about the value of remembered and forgotten information. Thus, the weaker forgetting bias exhibited by older adults may suggest that their beliefs are somewhat different relative to those of younger adults. That is, older adults may hold more accurate, albeit still biased, beliefs about the value of forgotten information relative to younger adults, and use that information in a compensatory fashion when making value judgments.

Our primary goals in Study 2 were to replicate key outcomes of Study 1 and to provide an additional assessment of people's beliefs. Specifically, given that the forgetting bias has only been observed with older adults in one experiment (i.e., Study 1), we aimed to replicate this effect to ensure that it is robust (cf. Pashler & Harris, 2012; Simons, 2014). Moreover, we investigated whether the difference in the magnitude of the forgetting bias between older and younger adults is stable and would persist. To directly explore the role of beliefs, we modified the procedure in Study 2 using the MPT procedure previously outlined (Rhodes et al., 2017). Specifically, prior to recalling the value for each word, participants made an MPT judgment (i.e., Did you recall this word earlier? yes or no).

Based on work suggesting that older adults rely on MPT when making memory judgments (e.g., Hines, Hertzog, & Touron, 2015; Tauber & Rhodes, 2012), we anticipated that they, like younger adults, would use it when asked to recall the values associated with each word. Specifically, if participants believe that forgotten information is less important than remembered information, they should recall higher values for words that were judged as remembered and lower values for words that were judged as forgotten, even when their MPT judgment is incorrect. Even so, if older adults have more accurate beliefs about the value of forgotten information, we would expect their reliance on MPT to be weaker relative to that of younger adults, which would result in a smaller forgetting bias (as observed in Study 1). Alternatively, relative to younger adults, older adults may have stronger beliefs about the likelihood that they will remember important information. If so, we would expect their reliance on MPT to be stronger, which would result in a larger forgetting bias.

Method

Participants. Forty younger adults ($M_{age} = 20.00$, $SE = 0.34$) from Texas Christian University participated in exchange for partial course credit, and 40 older adults ($M_{age} = 72.73$, $SE = 1.28$) who were recruited from the community participated in exchange for a $10 gift card. The gender distribution did not differ between younger adults (30 women, 10 men) and older adults (25 women, 15 men), $\chi^2(1, N = 80) = 1.46$, $p = .23$. Older adults reported completing significantly more years of education ($M = 16.55$,

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[2] Study list was included as a predictor in all analyses in Studies 1 and 2. As it did not influence any measure, or interact with any other predictors, we have removed it from all analyses to simplify interpretation.

Table 2
Logistic Hierarchical Linear Model for Recall in Study 1

Effect	Estimate	$e^{Estimate}$	t	95% Confidence Interval	
				Lower	Upper
Intercept	−.87 (.06)	.42	−14.91**	−.99	−.76
Age	.88 (.07)	2.41	12.42**	.74	1.02
Study value	.21 (.02)	1.23	10.38**	.17	.25
Age × Study Value	−.06 (.02)	.94	−2.79*	−.10	−.02
Random effects estimates					
Intercept	.02 (.02)	1.02		.01	.09
Study value	.01 (.002)	1.01		.002	.01

Note. The model included an intercept, two main effect predictors, and an interaction term. Older adults were coded as the reference group (i.e., 0 = older adults, 1 = younger adults). Study value was specified as a random effect. The intraclass correlation (ICC) was .01 with a 95% confidence interval from .002 to .03. Standard errors are in parentheses.
* $p < .05$. ** $p < .001$.

$SE = 0.41$) relative to younger adults ($M = 13.11$, $SE = 0.35$), $t(78) = 6.36$, $p < .001$, $d = 1.16$. Younger adults outperformed older adults on the pattern comparison task and the letter comparison task. Older adults outperformed younger adults on the vocabulary task (see Table 1 for descriptive and inferential statistics).

Materials and procedure. The materials and procedure were identical to Study 1, with one exception. Specifically, on the cued-recall test, participants made a self-paced recall judgment prior to recalling each value. Participants were presented with each word and asked "Did you recall this word earlier?" Participants responded by pressing "1" for yes and "2" for no. After making this judgment, participants recalled the value that they believed was assigned to each word. They repeated this procedure for all the words.

Results

Mixed-effects models with random participant effects were conducted. The analyses for Study 2 are complex and thus we highlight the primary conclusions here. Study 2 replicated the outcomes of Study 1. Specifically, older and younger adults showed the forgetting bias. The magnitude of the forgetting bias did not

differ between older and younger adults. Most important, both older and younger adults relied on MPT when recalling the values that were associated with each word, which supports the role of people's beliefs in the forgetting bias. Moreover, in contrast to the hypothesis that older adults have more accurate beliefs about the
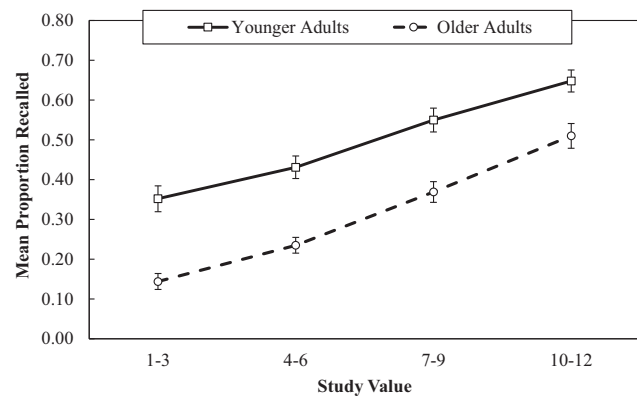

Figure 2. The mean recalled point value for words that were remembered and for words that were forgotten as a function of study value in Study 1. Error bars represent one standard error of the mean. Data for younger adults are presented in the top panel and data for older adults are presented in the bottom panel.

Figure 1. Participants' mean proportion correctly recalled as a function of study value and age group in Study 1. Error bars represent one standard error of the mean.
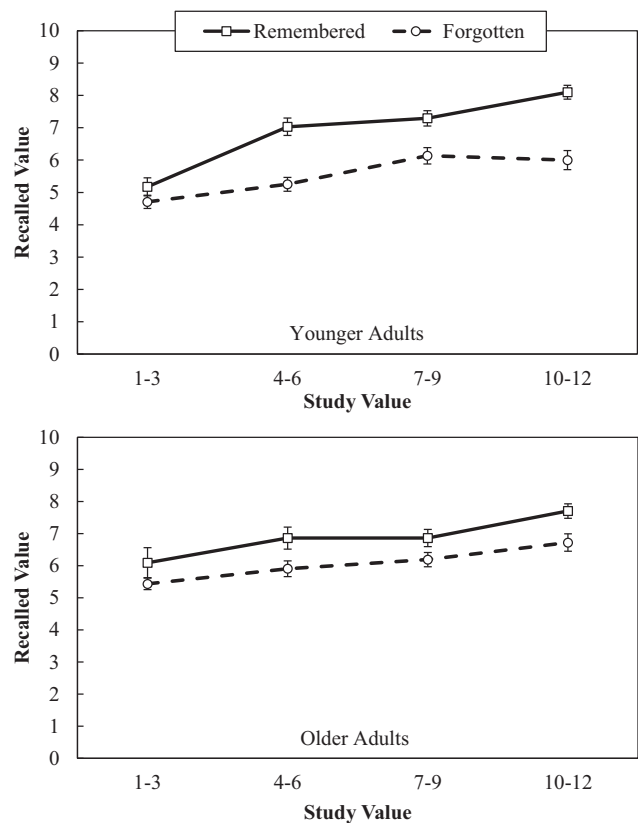
Table 3
Hierarchical Linear Model for Recalled Value in Study 1

Effect	Estimate	t	95% Confidence Interval	
			Lower	Upper
Intercept	5.98 (.11)	53.44**	5.76	6.19
Age	−.51 (.12)	−4.34**	−.75	−.28
Study value	.12 (.02)	5.11**	.07	.17
Recall	.90 (.18)	5.05**	.55	1.25
Age × Study Value	.02 (.03)	.49	−.05	.08
Age × Recall	.47 (.19)	2.43*	.09	.86
Study Value × Recall	.07 (.04)	1.64	−.01	.15
Age × Study Value × Recall	.08 (.06)	1.37	−.03	.19
Random effects estimates				
Intercept	.28 (.08)		.15	.50
Study value	.002 (.002)		.00	.02
Recall	.43 (.16)		.21	.87
Residual	7.52 (.17)		7.20	7.87

Note. The model included an intercept, three main effect predictors, three two-way interactions, and one three-way interaction. Older adults were coded as the reference group (i.e., 0 = older adults, 1 = younger adults). Study value and recall were specified as random effects. The intraclass correlation (ICC) was .04 with a 95% confidence interval from .02 to .06. Standard errors are in parentheses.
* $p < .05.$ ** $p < .001.$

value of forgotten information, older adults' reliance on MPT was greater than that of younger adults.

Analyses' of participants' MPT judgments are presented first. Though not of primary interest to the present research, this analysis establishes that there was variability in the accuracy of participants' MPT judgments. Next, we present the analysis of participants' free-recall performance for the words during the value-directed remembering task. Finally, we present the analysis of participants' recalled value.

Memory for past test accuracy. For the remainder of the results, we use MPT accuracy to describe participants' performance on the recall judgment task. MPT accuracy was dichotomous, with a value of "0" indicating that the participant made an incorrect memory judgment (e.g., forgotten words judged as recalled) and a value of "1" indicating that the participant made a correct memory judgment (e.g., forgotten words judged as forgotten). A logistic HLM analysis predicting MPT accuracy (0 = incorrect, 1 = correct) was conducted. The model included the intercept and three predictors: age group, study value, and word recall. Age group was dichotomous (0 = older adult, 1 = younger adult) as was word recall (0 = forgotten, 1 = remembered). Study value and word recall were specified as random effects. The interactions between these variables (i.e., three two-way interactions and one three-way interaction) were also included. The outcomes from the analysis are presented in Table 4.

Table 4
Logistic Hierarchical Linear Model for Memory for Past Test Judgments in Study 2

Effect	Estimate	$e^{Estimate}$	t	95% Confidence Interval	
				Lower	Upper
Intercept	.78 (.19)	2.18	4.06**	.40	1.16
Age	−.36 (.10)	.70	−3.50**	−.56	−.16
Study value	−.06 (.02)	.94	−2.52*	−.10	−.01
Recall	1.42 (.35)	4.14	4.00**	.73	2.12
Age × Study Value	.01 (.03)	1.01	.19	−.05	.07
Age × Recall	1.37 (.23)	3.94	5.95**	.92	1.82
Study Value × Recall	−.03 (.04)	.97	−.80	−.12	.05
Age × Study Value × Recall	−.01 (.06)	.99	−.09	−.13	.12
Random effects estimates					
Intercept	1.28 (.33)	3.60		.77	2.11
Study value	.002 (.002)	1.00		.00	.01
Recall	3.83 (1.07)	46.06		2.22	6.63

Note. The model included an intercept, three main effect predictors, three two-way interactions, and one three-way interaction. Older adults were coded as the reference group (i.e., 0 = older adults, 1 = younger adults). Study value and recall were specified as random effects. The intraclass correlation (ICC) was .28 with a 95% confidence interval from .19 to .39. Standard errors are in parentheses.
* $p < .05.$ ** $p < .001.$

Overall, MPT accuracy was high (see Figure 3). There was a significant main effect of word recall, indicating that older adults were 4.14 times more likely to make an accurate MPT judgment for remembered words relative to forgotten words. There was also a significant main effect of age indicating that younger adults were .70 times as likely to make an accurate MPT judgment as were older adults. Moreover, there was a significant interaction between age and word recall. To evaluate this interaction, we conducted a new model with the coding for age group reversed (i.e., 0 = younger adults, 1 = older adult). The interaction revealed that the difference in MPT accuracy for remembered relative to forgotten words was greater for young adults, $b = 2.79$ ($SE = .36$), $t = 7.67$, $p < .001$, 95% CI [2.08, 3.51], relative to older adults (i.e., $b = 1.42$). Finally, there was a significant main effect of study value. Specifically, while controlling for all other variables in the model, each one unit increase in study value resulted in participants being .94 times as likely to make an accurate MPT judgment. No other effects were significant.

Free-recall for words. A logistic HLM analysis predicting recall (0 = forgotten, 1 = recalled) was conducted. The model included the intercept and two predictors: study value and age group. Age group was dichotomous (0 = older adult, 1 = younger adult). Study value was specified as a random effect. The interaction between study value and age group was also included. The outcomes of the analysis are presented in Table 5.

There was a significant effect of age group, demonstrating that younger adults were 1.99 times more likely to recall a word than were older adults (see Figure 4). There was also a significant effect of study value. Specifically, for older adults, each 1-point increase in study value resulted in them being 1.24 times more likely to
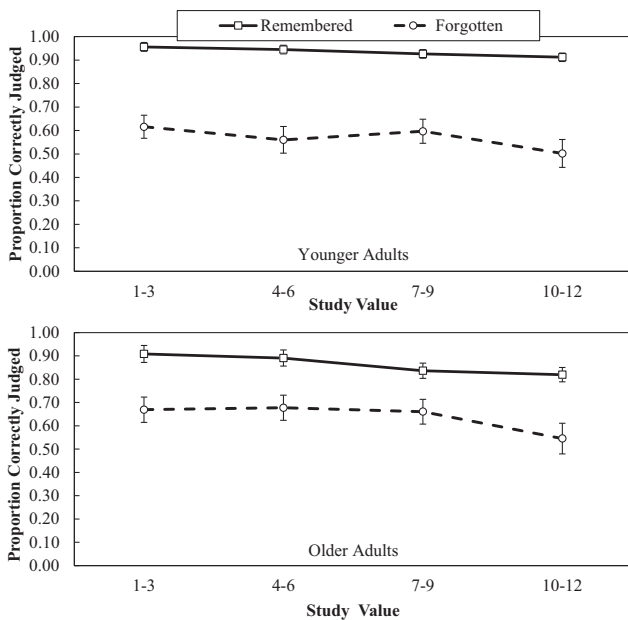
recall the word. Finally, there was a significant interaction between age group and study value. To probe this interaction, we conducted a new model with the coding for age group reversed (i.e., 0 = younger adults, 1 = older adult). This analysis revealed that the effect of study value on word recall was weaker for younger adults, $b = .15$ ($SE = .02$), $t = 6.96$, $p < .001$, 95% CI [.11, .19], relative to older adults (i.e., $b = .22$).

Value recall. An HLM analysis predicting participants' value recall was conducted. The model included the intercept and four predictors: study value, age group (0 = older adult, 1 = younger adult), word recall (0 = forgotten, 1 = recalled), and MPT accuracy (0 = incorrect, 1 = correct). Study value, word recall, and MPT accuracy were specified as random effects. The interactions between these variables (i.e., six two-way interactions, four three-way interactions, and one four-way interaction) were also included. A forgetting bias is evident if a significant main effect of recall is observed. Moreover, a significant interaction between recall and MPT accuracy would provide strong support for the hypothesis that participants' value recall is driven by their beliefs about their memory. Outcomes from the analysis are presented in Table 6.

Participants' recalled value as a function of study value, memory status (remembered vs. forgotten), and MPT accuracy is presented in Figure 5. There was a significant effect of MPT accuracy indicating that participants (younger and older adults) recalled higher values for words that were judged as having been remembered and lower values for words that were judged as having been forgotten. Moreover, there was a significant effect of word recall, indicating that participants recalled higher values for words that were actually remembered and lower values for words that were actually forgotten. More important, these effects were qualified by a significant interaction between recall and MPT accuracy. The interaction indicated that participants (younger and older adults) recalled higher values for words that were *judged* as remembered relative to words that were *judged* as forgotten, regardless of actual memory performance. That is, when participants made a correct MPT judgment, they recalled higher values for words that were remembered relative to words that were forgotten. In contrast, when participants made an incorrect MPT judgment, they recalled higher values for words that were forgotten (but judged as remembered) relative to words that were remembered (but judged as forgotten). The three-way interaction between study value, word recall, and MPT accuracy was also significant. To elucidate this interaction, we compared word recall and MPT accuracy at low (1 SD below the mean) and high (1 SD above the mean) study values. The results revealed that the two-way interaction was stronger for high study values, $b = 5.57$ ($SE = .40$), $t = 13.80$, $p < .001$, 95% CI [4.78, 6.36], relative to low study values, $b = 3.01$ ($SE = .61$), $t = 4.90$, $p < .001$, 95% CI [1.81, 4.22], though it was significant at both levels.

There was also a significant main effect of age, indicating that younger adults' recalled value was .94 points lower than was older adults' recalled value. In addition, there was a significant main effect of study value, indicating that each 1-point increase in study value was associated with a .13 point increase in recalled value, while controlling for everything else in the model. There was a significant interaction between study value and word recall, indicating that the effect of word recall on value recall (i.e., higher recalled values for remembered relative to forgotten words) was

Figure 3. Participants' mean proportion of remembered and forgotten items correctly judged as a function of study value and age group in Study 2. Error bars represent one standard error of the mean. Data for younger adults are presented in the top panel and data for older adults are presented in the bottom panel.

Table 5
Logistic Hierarchical Linear Model for Recall in Study 2

Effect	Estimate	$e^{Estimate}$	t	95% Confidence Interval Lower	Upper
Intercept	−.69 (.06)	.50	−12.02**	−.81	−.58
Age	.69 (.07)	1.99	9.81**	.55	.83
Study value	.22 (.02)	1.24	9.57**	.17	.26
Age × Study Value	−.07 (.02)	.93	−3.12*	−.11	−.02
Random effects estimates					
Intercept	.02 (.02)	1.02		.01	.09
Study value	.01 (.003)	1.01		.01	.02

Note. The model included an intercept, two main effect predictors, and an interaction term. Older adults were coded as the reference group (i.e., 0 = older adults, 1 = younger adults). Study value was specified as a random effect. The intraclass correlation (ICC) was .01 with a 95% confidence interval from .002 to .03. Standard errors are in parentheses.
* $p < .05$. ** $p < .001$.

greater for high value words relative to low value words. Finally, there was a significant interaction between age and MPT accuracy. To elucidate this interaction, we conducted a new model with the coding for age group reversed (i.e., 0 = younger adults, 1 = older adult). This analysis revealed that the effect of MPT accuracy on value recall was stronger for older adults (i.e., $b = -2.08$) relative to younger adults, $b = -1.40$ ($SE = .21$), $t = -6.59$, $p < .001$, 95% CI $[-1.82, -0.98]$. No other effects were significant.

Study 3

As in Study 1, older and younger adults in Study 2 demonstrated a forgetting bias. Moreover, consistent with analytic-processing theory, participants' beliefs played a key role in this bias. Specifically, both older and younger adults recalled higher values for words that were judged as remembered relative to words that were judged as forgotten, even when their judgments were incorrect.

The age-related differences in the forgetting bias observed in Study 1 were not present in Study 2. That is, whereas the forgetting bias was weaker for older adults than for younger adults in Study 1, this difference did not maintain in Study 2. It may be that the

finding in Study 1 was spurious and that older and younger adults have similar beliefs about the value of forgotten information. Consistent with this possibility, older adults in Study 2 relied on MPT more than did younger adults on the cued-recall test, which suggests that their beliefs were no more accurate than were those of younger adults.

In Study 3, we further evaluated older and younger adults' beliefs about forgetting using a measure that is frequently used in metacognitive research. Specifically, participants completed a survey (cf. Koriat et al., 2004) on which they estimated the frequency with which they forget important and unimportant information. If participants believe that forgotten information is less important than remembered information, they should report forgetting unimportant information more frequently than important information. We expected both older and younger adults to show this belief. Given the outcomes of the previous studies, it is possible that the magnitude of this belief may be smaller for older relative to younger adults (i.e., Study 1) or that it will be similar for older and younger adults (i.e., Study 2).

Method

Participants. Participants included 43 younger adults ($M_{age} = 23.47$, $SE = .47$) and 40 older adults ($M_{age} = 70.68$, $SE = .97$). Younger adults were recruited through Amazon Mechanical Turk and received 25 cents for participating. Older adults were recruited from the Fort Worth community and were compensated with a $5 gift card.[3] The gender distribution did not differ between younger adults (28 women, 15 men) and older adults (28 women, 12 men), $\chi^2(1, N = 83) = .23$, $p = .64$. Older adults reported completing significantly more years of education ($M = 16.48$, $SE = 0.36$) relative to younger adults ($M = 14.91$, $SE = 0.26$), $t(81) = 3.54$, $p = .001$, $d = 0.73$.

Figure 4. Participants' mean proportion correctly recalled as a function of study value and age group in Study 2. Error bars represent one standard error of the mean.

[3] Half of the older adult sample completed the survey in conjunction with an unrelated research protocol. A 2 (Secondary Task: Yes, No) × 2 (Value: Important, Unimportant) mixed ANOVA was conducted to evaluate whether the secondary task influenced older adults' estimates. The main effect of secondary task was not significant, $F < 1$, nor was the interaction between value and secondary task, $F(1, 38) = 3.58$, $p = .07$.
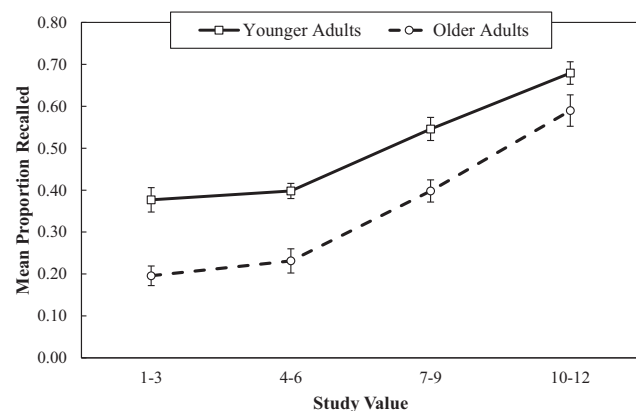
Table 6
Hierarchical Linear Model for Recalled Value in Study 2

Effect	Estimate	t	95% Confidence Interval	
			Lower	Upper
Intercept	6.81 (.18)	36.98**	6.45	7.17
Age	−.94 (.19)	−4.88**	−1.32	−.56
Study value	.13 (.04)	3.35**	.06	.21
Recall	−1.43 (.37)	−3.86**	−2.15	−.70
MPT accuracy	−2.08 (.20)	10.16**	−2.48	−1.68
Age × Study Value	.03 (.05)	.50	−.08	.13
Age × Recall	−.49 (.53)	−.92	−1.54	.55
Age × MPT Accuracy	.68 (.25)	2.73*	.19	1.17
Study Value × Recall	−.22 (.09)	−2.36*	−.39	−.04
Study Value × MPT Accuracy	−.09 (.05)	−1.87	−.18	.004
Recall × MPT Accuracy	4.32 (.39)	11.20**	3.57	5.09
Age × Study Value × Recall	.21 (.15)	1.41	−.08	.49
Age × Study Value × MPT Accuracy	−.02 (.07)	−.34	−.16	.11
Age × Recall × MPT Accuracy	−.17 (.57)	−.29	−1.29	.96
Study Value × Recall × MPT Accuracy	.37 (.10)	3.58**	.17	.57
Age × Study Value × Recall × MPT Accuracy	−.08 (.16)	−.51	−.39	.23
Random effects estimates				
Intercept	.59 (.18)		.32	1.08
Study value	.01 (.002)		.002	.02
Recall	.48 (.19)		.22	1.02
MPT accuracy	.47 (.18)		.22	1.01
Residual	6.38 (.15)		6.09	6.68

Note. The model included an intercept, four main effect predictors, six two-way interactions, four three-way interactions, and one four-way interaction. Older adults were coded as the reference group (i.e., 0 = older adults, 1 = younger adults). Study value, recall and memory for past test (MPT) accuracy were specified as random effects. The intraclass correlation (ICC) was .08 with a 95% confidence interval from .05 to .15. Standard errors are in parentheses.
* $p < .05$. ** $p < .001$.

Materials and procedure. Participants took a two-question survey, on which they were asked "When you forget information, how often is that information important (unimportant)?" Participants responded using a scale from 1 (*never*) to 10 (*always*). Participants were given unlimited time to answer the questions and the order of the questions (i.e., important vs. unimportant) was counterbalanced across participants.

Results

Participants' estimates are presented in Figure 6. Participants' estimates were analyzed with a 2 (Value: Important, Unimportant) × 2 (Age Group: Older Adults, Younger Adults) mixed ANOVA. There was a significant main effect of value, $F(1, 81) = 24.77$, $p < .001$, $\eta_p^2 = .23$, indicating that people gave higher estimates to unimportant ($M = 6.49$, $SE = .21$) relative to important information ($M = 4.77$, $SE = .24$). There was also a significant main effect of age group, $F(1, 81) = 8.36$, $p = .005$, $\eta_p^2 = .09$, indicating that younger adults gave higher estimates ($M = 6.02$, $SE = .23$) than did older adults ($M = 5.21$, $SE = .25$). The interaction between value and age group was not significant, $F < 1$, indicating that the magnitude of the belief that unimportant information is forgotten more frequently than is important information was similar for older and younger adults. Further, 68% of older adults ($n = 27$) and 67% of younger adults ($n = 29$) demonstrated this belief.

General Discussion

Given that people's monitoring judgments can influence their behavior and subsequent memory, it is important to understand the mechanisms that influence their judgments. In the present research, we explored the contribution of older adults' beliefs to the forgetting bias previously observed with younger adults (Castel et al., 2012; Rhodes et al., 2017). We evaluated older and younger adults' beliefs using a value-directed remembering task with a cued-recall test for values and a memory for past test paradigm established in prior research, and using a survey as is commonly used in metacognitive research (e.g., Koriat et al., 2004; Mueller et al., 2013; Witherby & Tauber, 2017). We expected that older adults' beliefs would play an important role in the forgetting bias, as ample evidence with younger adults has found beliefs to be central to their monitoring judgments (for a review, see Dunlosky et al., 2015). Moreover, older adults may be especially likely to rely on their beliefs when monitoring their performance, because relying on their prior knowledge is an effective strategy to compensate for their limited cognitive resources available for the task (e.g., Baltes & Baltes, 1990).

In Studies 1 and 2, when older adults were asked to recall the value that was associated with each word during a value-directed remembering task, they recalled lower values for words that they forgot relative to words that they remembered. Moreover, we replicated prior work that has established a forgetting bias with
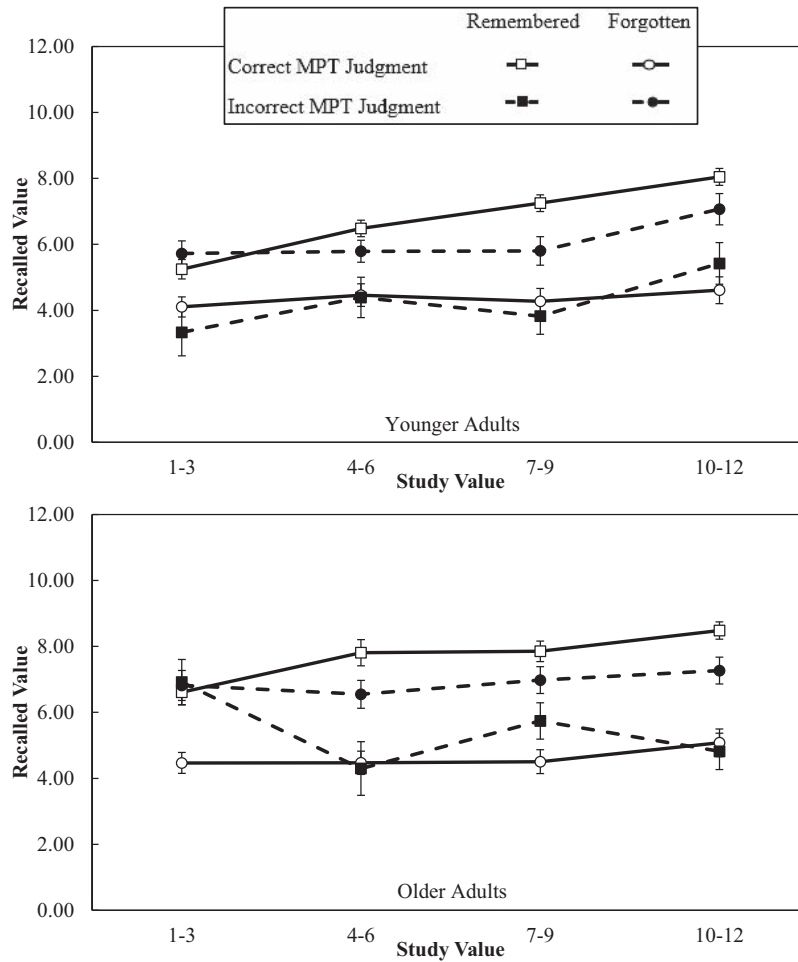
Figure 5. The mean recalled point value for words that were remembered and for words that were forgotten as a function of memory for past test (MPT) accuracy (correct or incorrect) and study value in Study 2. Error bars represent one standard error of the mean. Data for younger adults are presented in the top panel and data for older adults are presented in the bottom panel.

younger adults, demonstrating that this effect is robust. In Study 2, we evaluated the contribution of people's beliefs by having them make an MPT judgment prior to recalling the value of each word (cf. Rhodes et al., 2017). Specifically, if participants believe that forgotten information is less important relative to remembered information, they should provide higher values to words judged as remembered and lower values to words judged as forgotten, even when their judgments are incorrect. The outcomes of Study 2 were consistent with this hypothesis. Specifically, when participants made correct memory judgments, they demonstrated the typical forgetting bias (i.e., higher recalled values for words that were remembered relative to words that were forgotten). In contrast, when participants made incorrect memory judgments, they recalled higher values for words that were forgotten (but judged as remembered) relative to words that were remembered (but judged as forgotten).

In Study 3, when participants were directly asked how frequently they forget important and unimportant information, both older and younger adults reported that they forget unimportant information more frequently relative to important information.

Thus, this belief appears to be pervasive and applied on an item-by-item scale (i.e., Studies 1 and 2) as well as on a global scale (Study 3). As further evidence supporting the role of beliefs in the forgetting bias, participants' source memory (i.e., memory for the study values) was poor in Studies 1 and 2 (Study 1: older adults $M = .10$, $SE = .01$, younger adults $M = .15$, $SE = .01$; Study 2: older adults $M = .10$, $SE = .01$, younger adults $M = .13$, $SE = .01$). This suggests that participants' memory for the specific values likely played only a small role in the forgetting bias. Instead, participants may have used a strategic process whereby they relied on their memory for the free-recall tests and used their beliefs about forgetting to recall higher values for words judged as remembered and lower values for words judged as forgotten.

Taken together, the outcomes of the present studies demonstrate that although older adults have a lifetime of experience forgetting important information, they do not adequately take these experiences into account when asked to recall the objective importance of remembered and forgotten information. Instead, older and younger adults appear to have similar beliefs about the value of forgotten information, which result in both age groups showing the
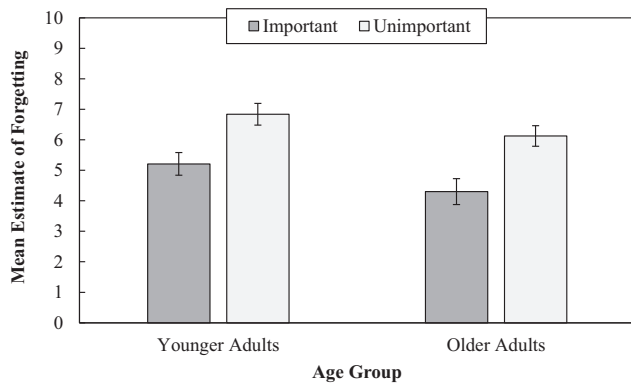
Figure 6. Older and younger adults' mean estimates of forgetting important and unimportant information in Study 3. Error bars represent one standard error of the mean.

forgetting bias. These findings fit well with existing metacognitive theory (e.g., Dunlosky et al., 2015; Koriat, 1997). Specifically, younger and older adults relied on the same cue—and used their beliefs about that cue—to monitor their performance. People appear to hold the belief that forgotten information is less important than is remembered information and they use this belief when they are asked to remember the value of a forgotten word (i.e., If I forgot it, it must have been a low-value item).

With regards to the forgetting bias, although the present work provides strong support for the role of people's beliefs, it is also possible that other mechanisms contribute to this effect (e.g., fluency). Recent work with younger adults has demonstrated that fluency (i.e., the ease of processing information) plays a minimal role in the forgetting bias with younger adults (Rhodes et al., 2017); however, it may play a more substantial role to the forgetting bias with older adults (but see Brashier et al., 2017). In addition, it will be important for researchers to evaluate the contributions of beliefs and fluency to other cue effects with older adults. For younger adults, researchers have found that in some cases people's beliefs are critical to their monitoring judgments (e.g., Mueller et al., 2013, 2014), whereas in others the fluency people experience during a task is critical (e.g., Besken, 2016; Susser & Mulligan, 2015; Undorf & Erdfelder, 2015). Moreover, in other instances, fluency and beliefs may both contribute to people's monitoring judgments (e.g., Frank & Kuhlmann, 2017).

Although the forgetting bias has been shown in several experiments, an important direction for future research will be to evaluate the extent to which this bias influences people's decisions and behaviors. A key tenet of self-regulated learning theory is that people's monitoring of learning influences how they regulate their behavior (e.g., Rhodes & Castel, 2009; for reviews, see Bjork, Dunlosky, & Kornell, 2013; Kornell & Finn, 2016). Thus, if people believe that forgotten information is unimportant, it is unlikely that they will engage in strategies to help them remember information that has been forgotten. For example, if an older adult realizes that he forgot to do something, he may not make an effort to remember what it was if he simply believes that forgotten information is typically unimportant.

Moreover, future research should investigate individual differences in the forgetting bias. For instance, people with especially poor memory may not show a forgetting bias (or may show a smaller bias), perhaps holding the belief that forgetting is equally prevalent for important and unimportant information. We were unable to effectively evaluate this idea in Studies 1 and 2 because there was little variability in recall. Thus, evaluating this issue with materials that afford greater variability will add to our understanding of the role of beliefs in the forgetting bias. Relatedly, although individuals with Alzheimer's disease can strategically learn valuable information (e.g., Wong et al., 2018) they may be less likely than individuals without Alzheimer's disease to believe that forgotten information is less important than is remembered information given how frequently they experience forgetting. As such, they may not show a forgetting bias. In addition, people's self-evaluations of their memory may influence the forgetting bias. Specifically, individuals who regard their memory as excellent may demonstrate a larger forgetting bias relative to individuals with a more negative perception of their memory.

In sum, the present research was the first to demonstrate that older adults' beliefs contribute to their monitoring judgments made about forgotten information. In addition, we demonstrated that older adults, like younger adults, show a forgetting bias and that this bias is driven by their belief that forgotten information is less important than is remembered information. Thus, although older adults have more experience with forgetting, have had more opportunities to forget important information, and likely have had many experiences dealing with the consequences of forgetting important information, their beliefs about the importance of remembered and forgotten information do not appear to differ from younger adults. Indeed, older adults, like younger adults, use their beliefs about memory to monitor the importance of forgotten information.

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